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mechanical stimulation. The reaction time is in effect the same, provided the intensity and duration are made as nearly as possible the same as with the electrical stimulation. Increasing the duration of the stimulation up to a certain point has no appreciable effect on the interval between the *end* of the stimulation and the rise of the secondary sensation. But when a certain point has been reached, then further increase in the duration has just the opposite effect. The interval from the *beginning* of the stimulation to the rise of the secondary sensation remains constant, while the interval measured from the *end* of the stimulation diminishes. The explanation, here, is the same as in the case of electrical stimulation; when the total stimulation has reached the intensity necessary to awaken the secondary sensation, a further increase of the stimulation has no effect on the time. The time required for the rise of the secondary sensation was found to be on the wrist shorter, and on the sole of the foot about half a second longer, than the time given above.

The secondary, or after-sensation, is a "summation-phenomenon." A mechanical stimulation, since it is competent to produce this secondary sensation, should never be regarded as a single stimulus, but always as a series of stimuli. Where this summation takes place it is impossible to say with certainty, but Goldscheider argues that it most probably takes place in the cellular elements scattered throughout the nerve tract. Each stimulus takes two paths; one goes directly to the centre of consciousness, the other is impeded on its way by the cellular elements and only succeeds in making its way on to the centre under certain conditions. The cells "store" the energy, and a series of stimuli is needed to make the stored energy amount to enough to express itself in action. When this does happen, however, these cells send also their message to the centre, but by a different path, which we may appropriately call the "summation-path." This summation-path, via the gray matter of the spinal cord, is the same as has been called the "pain-path." A single stimulus, if of exorbitant intensity, may be sufficient to break its way through this pain-path. When this is the case, we may have both the primary and the secondary sensations coming over the same path; in the original experiment, when we made the stimulus strong enough to give the pain tone to the primary sensation, we still had the secondary or summation-phenomenon, though, in this case, weaker than the primary.

CHAS. M. BAKEWELL.

Harvard.

SERGI, *Su alcuni caratteri del senso tattile, Osservazioni sperimentali.* Rivista di filosofia scientifica, 1891 X. 590.

A series of electric forks of 50, 100, 250, 435, 500 and 1000 v. was employed, a rigid and obtuse point of brass being substituted for the long fine point used for writing on the drum. The point was applied to some point of the skin to test the limit of rapidity of the blows given by the point that could be perceived as separate. The fleshy part of the fingers could perceive the stimulus as a succession of blows up to 1000 per sec.; many other parts of the hand, the point of the tongue and the red parts of the lips perceived 500, the greater part of the skin perceived 435 per sec. as a succession, which increased in clearness down to 50 v. The question of the intensity of the excitation and the special sensitiveness of the organ stimulated are then taken up. The final results of the experiments can be summarized as follows: 1. The cutaneous surface is not everywhere equally sensitive to tactile stimuli of small intensity; the most sensitive parts are always the palmar extremities of the fingers. 2. Many parts of the skin, although giving a definite sensation of touch, do not give it in the same clear and distinct

way as the digital extremities of the hand. 3. The minimum energy of stimulation, or the least perceptible stimulus, is variable according to the different points of the surface of the skin; in the successive stimulations at equal intervals, as with the tuning-fork, the only sensation which results is not produced by the fusion of the impressions through their persistence, as Bloch would have us believe, but through the insensibility to weak stimuli; that is why the stimulating point is felt as being firm if it is in immediate contact with the skin. 4. In tactile sensations properly so-called, that is, those of the skin, it seems that there is no persistence of the impressions, when the stimuli are limited to and produced by an obtuse point. This does not say that there is an accumulation of small impressions to produce a single result, as usually happens for some other senses and for electrical cutaneous stimulation (Richet). These phenomena on the contrary occur when there is a transformation of tactile impressions into sensations of pressure, i. e., when we cause an obtuse point to penetrate into the surface of the skin by pressure, and when there is a powerful stimulus with a large surface of special character. 5. It appears also that there is not any primary action, or period of latency, in the tactile sensations by which the sensation is developed in a shorter or a longer time, as happens in the case of the retina; it seems that excitation of a purely mechanical nature produces its effects immediately, and if it does not produce them at the first moment, then there is no perceptible effect; one can explain in the same manner also the lack of persistence, in addition to action of a weak stimulus, by the absence of the time of latency in the terminal organs of touch. If there be a primary action it must be of a duration absolutely incalculable, since a series of sensations with an interval of 1-1000 sec. can be perceived. 6. On the mucous membrane of the glans penis there is no sensation of a tactile character such as is found in the skin.

E. W. SCRIPTURE.

SERGI, *Ueber einige Eigenthümlichkeiten des Tastsinns*, Zt. f. Psychologie u. Physiol. Sinn. 1892, III. 175.

An unacknowledged translation of preceding.

E. W. S.

BUYS, *Recherches experimentale sur la sensibilité de l'ovaire*, Archiv. ital. de Biol. 1891 I.

Chaiguot had found that, in very many cases, during the later weeks of pregnancy touch upon the abdomen resulted in temporary, but clearly localized, pain of a peculiar kind. As exceptions were not wanting, it was left to decide whether the painful cases were due to disease of the ovary or simply to the greater sensitiveness of the individual. By means of an incision from behind, Buys contrived to apply an induction current to the ovaries of six dogs, and also to use direct mechanical stimulation. Strong irritation of the ovary produces intense pain, dilation of the pupil, increase of blood pressure through vascular constriction and slowing of the pulse through increase of the tonus of the pneumogastric. We are thus led to believe that numerous morbid alterations of these organs in certain circumstances influence circulation by affecting the vaso-motor centers. Thus may be explained, through ovarian irritation, disorders of local circulation so common during the menstrual period of life, or at the close of it.

Harvard.

J. F. ANGELL.

BITOT ET SABRAZÈS, *L'analgésie et l'atrophie des testicules dans l'ataxie locomotrice progressive*, Rev. de med. 1891.

This is a critical account of a number of cases of locomotor ataxia, from which conclusion is reached that analgesia of the testicles is so